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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SCOTT T. SHEPPARD, R. PETER SMITH, YIFENG WU, STEN HEIKMAN, and MATTHEW JACOB-MITOS

Appeal 2015-005063
Application 12/118,243
Technology Center 2800

Before LINDA M. GAUDETTE, KAREN M. HASTINGS, and DEBRA L. DENNETT, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1, 2, 4–8, 12–18, 30 and 33–35 under 35 U.S.C. § 103(a) over at least the basic combination of Sheppard (US 2007 /0158683 Al, published July 12, 2007) and Qiao (*Low resistance ohmic contacts on AIGaN/GaN structures using implantation and the "advancing" Al/Ti metallization,* 74 APPLIED PHYSICS LETTERS 2652–54 (1999))[1]. We have

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[1] The Examiner applied additional references to this basic combination to reject various dependent claims (for a full listing of the rejections, *see*, Final Action 8–11; Ans. 8–12).
Appellants do not separately argue these additional rejections (*see, e.g.*, App. Br. 4).

jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

Claim 1 is representative of the claimed invention (emphasis added):

1. A method of forming a semiconductor device, comprising:

providing a dielectric layer on a Group III-nitride semiconductor layer;

selectively removing portions of the dielectric layer over spaced apart source and drain regions of the semiconductor layer;

implanting ions having a first conductivity type directly into the source and drain regions of the semiconductor layer *wherein an implantation energy is selected to provide a peak implant concentration near a two dimensional electron gas region at an interface of the semiconductor layer and a channel layer underlying the semiconductor laye*r, wherein the ions are implanted at an implant energy less than about 80 keV;

after selectively removing the portions of the dielectric layer, annealing the semiconductor layer and the dielectric layer to activate the implanted ions; and

providing metal contacts on the source and drain regions of the semiconductor layer.

Appellants focus the arguments on independent claim 1 (App. Br. 7–10) and dependent claim 4 (App. Br. 11; Reply Br. 2). Appellants do not present separate arguments for any of the other dependent claims, including those separately rejected. Thus, all the claims stand or fall together, except for dependent claim 4.

ANALYSIS

Upon consideration of the evidence on this record and each of Appellants' contentions, we find that the preponderance of evidence on this record supports the Examiner's conclusion that the subject matter of

Appellants' representative claim 1 is unpatentable over the applied prior art. On the other hand, we agree with Appellants that the Examiner has not adequately explained how the prior art teaches or suggests the subject matter of dependent claim 4. We thus sustain the Examiner's § 103 rejections essentially for the reasons set out by the Examiner in the Answer, but reverse as to claim 4.

We add the following for emphasis.

It is axiomatic that "the PTO must give claims their broadest reasonable construction consistent with the specification . . . . Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation." *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007). "[A]s applicants may amend claims to narrow their scope, a broad construction during prosecution creates no unfairness to the applicant or patentee." *Id.*

The Examiner relies upon Qiao for the details of a direct ion implantation step to be used in Sheppard (e.g., Ans. 3). Appellants argue that the claimed direct implantation energy being selected to provide a peak implant concentration "near" the "two dimensional electron gas region" [2DEG region/interface] as recited in claim 1 is not taught in Qiao, and that Qiao only teaches that an indirect implantation method can achieve this location. (App. Br. 8 and 9; Reply Br. 1 and 2). Appellants further contend that the Examiner's position that it would have been obvious to adjust the power below 40keV in Qiao's direct implantation method to achieve a closer location for its direct implantation method is "pure speculation on the part of the Examiner" (App. Br. 6–7; Reply Br. 1 and 2).

The Examiner points out that Appellants' argument for claim 1 relies upon the meaning of "near" (Ans. 13 and 14). The only specific location described in the Specification is "*e.g.,* within about 100 Å of the interface" (Spec. ¶ 67 (emphasis added); *see also*, dependent claim 4). It is well established that limitations not appearing in the claim cannot be relied upon for patentability. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982).

Appellants have not directed our attention to any persuasive reasoning or credible evidence to establish that the Examiner's interpretation that the claim encompasses a peak concentration within 270 Å of the 2DEG interface as described in Qiao for the Sheppard/Qiao combination is unreasonable. Notably, there is no special definition in the Specification that would establish that claim 1 is limited to circumstances where "near" means within 100 Å. Indeed, Appellants' Specification merely states that, in some embodiments, the peak is "slightly within" the channel layer, "e.g., [for example]" the peak concentration may be "within about 100 Å of the interface between the channel layer and boundary layer" (Spec. ¶ 67).

On the other hand, with respect to dependent claim 4, Appellants contend that the Examiner's position that it would have been obvious to adjust the power below 40keV in Qiao's direct implantation method to achieve a closer location for its direct implantation method is "pure speculation on the part of the Examiner" (App. Br. 6–7; Reply Br. 1 and 2; Ans. 14). Appellants describe using an implant step at an energy of about 40 to about 80 keV, and an embodiment of about 50 keV, in their method (Spec. ¶ 70). As Appellants also point out, Qiao teaches the advantage of using indirect implantation is to achieve the projected range of the Si ions,

Rp, closer to the semiconductor surface region than is achievable with direct implantation (App. Br. 10, Qiao p. 2652, col. 2; *see also* Reply Br. 4).

In light of these circumstances, the Examiner has not adequately explained why one of ordinary skill in the art would have had a reason to use a direct implantation method to achieve a location within about 100 Å for the peak concentration, and we reverse the Examiner's § 103 rejection of claim 4.

We sustain the Examiner's § 103 rejections of all the other claims on appeal.

The decision of the Examiner is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART